

### **REMARKS**

This communication responds to the Office Action mailed on August 17, 2007. Claims 1, 7, 24, 29 are amended, no claims are canceled, and no claims are added; as a result, claims 1-11, 24-34, and 39-42 are now pending in this application.

#### **Double Patenting Rejection**

Claims 1-11, 24-34, and 39-42 were provisionally rejected under non-statutory obviousness-type doctrine of double patenting as being unpatentable over claims 13-16, 19-20, and 23-24 of co-pending Application No. 11/494,056.

Applicant does not admit that the claims are obvious in view of co-pending Application No. 11/494,056. However, a Terminal Disclaimer in compliance with 37 C.F.R. 1.321(b)(iv) will be considered upon indication of allowance of the claims.

#### **§103 Rejection of the Claims**

Claims 1-4, 7-11, 24-34, and 39-41 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Liu ('078) in view of Szwejkowski ('499). Applicant respectfully traverses this rejection.

Liu has been previously discussed and discloses a first photoresist mask 106 to etch a first pattern 108 in an amorphous carbon hard mask 104 and removing the first photoresist 106 (see figure 2C) by a plasma process with no indication or discussion of residual photo resist problems. A second photoresist mask 110 is used to etch a second pattern 112 on the same hard mask 104 and plasma removing the second photoresist (see figure 2E), again with no disclosure or suggestion of any possible residual photo resist issue. The combination pattern in the hard mask 104 of the first and the second masks (108 and 114) is used to etch a pattern 116 into the substrate 102.

Applicant respectfully submits that there is no suggestion in Liu of a problem with residual photoresist, and Liu does not suggest treating the surface of the substrate to remove residual resist under conditions that are selective to the hard mask and to the substrate, since there is no discussion of residual resist in Liu, or even any recognition of such an issue existing.

This deficiency in Liu was recognized by the Office in the prior Office Action dated May 2, 2007 on page 5, in the second paragraph. Applicant thus respectfully submits that Liu provides no motivation for one of ordinary skill in the art to make the suggested combination of references.

Szwejkowski discloses removing a silicon and oxide containing sidewall material 26 which inadvertently formed during polysilicon anisotropic etch of the polysilicon layer 20 to form polysilicon line 28 (see col. 1, lines 32-42, and col. 2, lines 4-11, to show that sidewall material 26 is not a residual portion of the photoresist 32, or organic polymer material). Thus, Applicant respectfully submits the material 26 would not be understood by one of skill in the art to be a photo resist.

Applicant further submits that sidewall material 26 is removed by HF, being formed of silicon and oxides (see col. 2, lines 29-38; col. 3, lines 5-11) and “not purely polysilicon” (see col. 3, line 8). Applicant further submits that the disclosed removal methods, such as HF etching, would clearly imply removing a dielectric material to one of ordinary skill in the art, and not residual photoresist. Therefore, Applicant maintains that the cited reference does not teach or suggest removing organic photo resist.

Applicant respectfully submits that the suggested combination of references fails to describe or suggest at least the claimed features of “...*surface treating the substrate to remove residual resist disposed in contact with at least one of the top surface of the hard mask and the substrate under conditions that are selective to the hard mask and to the substrate...*”, as recited in independent claim 1, as amended herein, from which claims 2-6 depend. Neither reference suggests an organic photoresist residue, nor a residue on the hard mask, nor a residue in contact with the substrate.

For similar reasons, Applicant respectfully submits that the remaining independent claims are also patentable over the suggested combination of references. The dependent claims are believed to be patentable at least as depending from patentable base claims as shown above, since any claim depending from a nonobvious independent claim is also nonobvious. See M.P.E.P. § 2143.03. In view of the above noted claim amendments, and discussion of the failure of the references to describe or suggest at least removing residual photoresist in contact with the

substrate, Applicant requests this rejection under 35 U.S.C. § 103(a) be reconsidered and withdrawn.

Claims 5-6, 11, 25-29, and 31-34 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Liu ('078) in view of Szwejkowski ('499) as applied to claims 1-4, 7-11, 24-34, and 39-41 above, and further in view of Chen ('435). Applicant respectfully traverses this rejection.

Liu discloses two different photoresist masks 106 and 110 to etch a first pattern 108 and then a second pattern 112 in an amorphous carbon hard mask 104. The photoresist layers are each removed after each etch by a plasma process with no indication or discussion of residual photo resist problems. The combination pattern in the hard mask 104 of the first and the second masks (108 and 114) is used to etch a pattern 116 into the substrate 102. There is no suggestion in Liu of a problem with residual photoresist, nor treating the surface of the substrate to remove residual resist, nor any recognition of such an issue existing, and therefore, Liu can not provide motivation for one of ordinary skill in the art to obtain the present claimed arrangement.

Szwejkowski discloses removing a silicon and oxide containing sidewall material 26, which is not a residual portion of the photoresist 32, nor an organic polymer material. The sidewall 26 is removed by HF since it is formed of silicon and oxides (see col. 2, lines 29-38; col. 3, lines 5-11) and “not purely polysilicon” (see col. 3, line 8) – it is not a photoresist residue. Applicant respectfully submits that the cited reference does not teach or suggest removal of organic photo resist.

Chen is used in the outstanding Office Action to show that solutions of ammonium hydroxide and peroxide are known. Applicant respectfully submits that the addition of Chen does nothing to cure the above noted failure of the other references to teach or suggest a surface treatment to remove residual photo resist material.

Applicant respectfully submits that the suggested combination of references fails to describe or suggest at least the claimed features of “...*surface treating the substrate to remove residual resist disposed in contact with at least one of the top surface of the hard mask and the substrate under conditions that are selective to the hard mask and to the substrate...*”, as recited

in independent claim 1, as amended herein, from which claims 5-6 depend. Neither reference suggests a photoresist residue, nor a photoresist residue in contact with the substrate.

For similar reasons, Applicant respectfully submits that the remaining independent claims are also patentable over the suggested combination of references. The dependent claims are believed to be patentable at least as depending from patentable base claims as shown above, since any claim depending from a nonobvious independent claim is also nonobvious. See M.P.E.P. § 2143.03. In view of the above noted claim amendments, and discussion of the failure of the references to describe or suggest at least removing residual photoresist, Applicant requests this rejection under 35 U.S.C. § 103(a) be reconsidered and withdrawn.

Claim 42 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Liu ('078) in view of Szejewski ('499) as applied to claims 1-4, 7-11, 24-34, and 39-41 above, and further in view of Fang ('338). Applicant respectfully traverses this rejection.

Liu discloses two different photoresist masks 106 and 110 to etch a first pattern 108 and then a second pattern 112 in an amorphous carbon hard mask 104. The photoresist layers are each removed after each etch by a plasma process with no indication or discussion of residual photo resist problems. The combination pattern in the hard mask 104 of the first and the second masks (108 and 114) is used to etch a pattern 116 into the substrate 102. There is no suggestion in Liu of a problem with residual photoresist, nor any sort of substrate surface treatment to remove residual resist, nor any recognition of such an issue existing, and Liu can not therefore provide motivation for one of ordinary skill in the art to obtain the present claimed arrangement.

Szejewski discloses removing a silicon and oxide containing sidewall material 26, which is not a residual portion of the photoresist 32, nor an organic polymer material. The sidewall 26 is removed by HF, since it is formed of silicon and oxides (see col. 2, lines 29-38; col. 3, lines 5-11) and “not purely polysilicon” (see col. 3, line 8) – it is not a photoresist residue. Applicant respectfully submits that the cited reference does not teach or suggest removal of organic photo resist.

Fang is used in the outstanding Office Action to show that it is known to use solutions including sulfuric acid and citric acid. Applicant respectfully submits that the addition of Fang

does nothing to cure the above noted failure to suggest a surface treatment to remove residual photo resist material.

Applicant respectfully submits that the suggested combination of references fails to describe or suggest at least the claimed features of “...*patterning a carbon-containing hard mask over a substrate with a photoresist; removing the photoresist; surface treating the substrate to remove residual photoresist in contact with the substrate under conditions that are selective to the hard mask and to the substrate; and dry etching the substrate through the hard mask...*”, as recited in independent claim 39, from which claim 42 depends. The cited references, whether taken alone or in any combination, do not suggest a surface treatment to remove residual photoresist or photoresist in contact with the substrate. Thus, the suggested combination of references, even if there were proper motivation shown to make the combination, still does not suggest at least the above recited feature of the claims.

The dependent claim is believed to be patentable at least as depending from a patentable base claim, since any claim depending from a nonobvious independent claim is also nonobvious. See M.P.E.P. § 2143.03. In view of the above noted claim amendments, and discussion of the failure of the references to describe or suggest at least removing residual photoresist, Applicant requests this rejection under 35 U.S.C. § 103(a) be reconsidered and withdrawn.

#### Reservation of Rights

In the interest of clarity and brevity, Applicant may not have equally addressed every assertion made in the Office Action, however, this does not constitute any admission or acquiescence. Applicant reserves all rights not exercised in connection with this response, such as the right to challenge or rebut any tacit or explicit characterization of any reference or of any of the present claims, the right to challenge or rebut any asserted factual or legal basis of any of the rejections, the right to swear behind any cited reference such as provided under 37 C.F.R. § 1.131 or otherwise, or the right to assert co-ownership of any cited reference. Applicant does not admit that any of the cited references or any other references of record are relevant to the present claims, or that they constitute prior art. To the extent that any rejection or assertion is based upon the Examiner's personal knowledge, rather than any objective evidence of record as manifested by a cited prior art reference, Applicant timely objects to such reliance on Official

Notice, and reserves all rights to request that the Examiner provide a reference or affidavit in support of such assertion, as required by MPEP § 2144.03. Applicant reserves all rights to pursue any cancelled claims in a subsequent patent application claiming the benefit of priority of the present patent application, and to request rejoinder of any withdrawn claim, as required by MPEP § 821.04.

### CONCLUSION

Applicant respectfully submits that the claims are in condition for allowance, and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney at (210) 308-5677 to facilitate prosecution of this application. If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

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Date November 15, 2007

By / Mark V. Muller /  
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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: MS Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on this 19<sup>th</sup> day of November, 2007.

Amy Moriarty  
Name

[Signature]  
Signature